UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/561,830	12/22/2005	Ryotaro Hayashi	SHIGA7.040APC	5909

20995 7590 06/02/2009

KNOBBE MARTENS OLSON & BEAR LLP
2040 MAIN STREET
FOURTEENTH FLOOR
IRVINE, CA 92614

EXAMINER	
EOFF, ANCA	

ART UNIT	PAPER NUMBER
1795	

NOTIFICATION DATE	DELIVERY MODE
06/02/2009	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

jcartee@kmob.com
eOAPilot@kmob.com

Office Action Summary	Application No.	Applicant(s)	
	10/561,830	HAYASHI ET AL.	
	Examiner	Art Unit	
	ANCA EOFF	1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *25 February 2009*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,3,5,7,8,12-18 and 20-23* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,3,5,7,8,12-18 and 20-23* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *01/16/2009*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. Claims 1, 3-5, 7-8, 12-18 and 20-23 are pending. Claims 1, 6, 9-11 and 19 have been canceled.

2. The foreign priority documents JP 2003-189707 filed on July 01, 2003 and JP 2004-119498 filed on April 14, 2004 were received and acknowledged. However, in order to benefit of the earlier filing dates, certified English translations are required.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

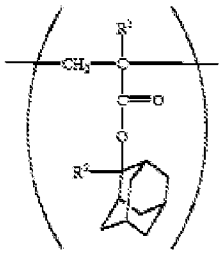
> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1, 3-5, 7, 12-18, 20 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fujishima et al. (US Patent 6,239,231).

With regard to claims 1, 3-5 and 17, Fujishima et al. disclose a chemical amplifying positive resist composition comprising a resin, an acid generator (abstract) and a solvent (column 9, lines 1-15).

Fujishima et al. disclose a resin comprising:

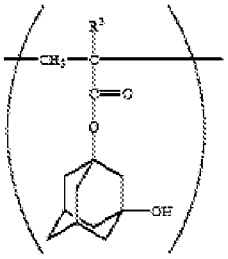
- an unit of 2-alkyl-2-adamantyl (meth)acrylate of formula (I):



(I) (formula (I) in column 2, lines 35-45), wherein R^1 represents hydrogen or methyl and R^2 represents an alkyl (column 2, lines 50-51).

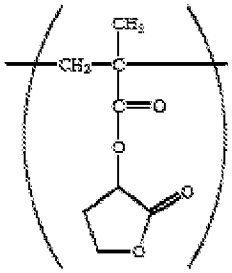
The alkyl-2-adamantyl in this unit is cleaved by the action of an acid and hence this unit contributes to the enhancement of alkali-solubility after exposure of the resist film (column 4, lines 44-51). This unit is equivalent to unit (a1) of the instant application.

- an unit of 3-hydroxy-1-adamantyl(meth)acrylate of formula (II):



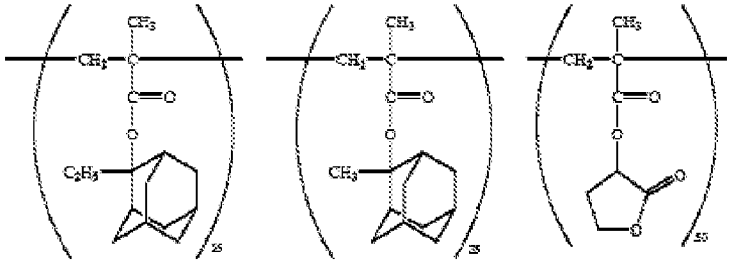
(II) (formula (II) in column 2, lines 55-65), wherein R^3 represents hydrogen or methyl (column 3, line 1), equivalent to the unit (a4) of the instant application.

- an unit of α-methacryloyloxy-γ-butyrolactone represented by the formula (III):



(III) (formula (IV) in column 3, lines 14-15 and 25-35), equivalent to the unit (a3) of the instant application.

Fujishima et al. also disclose that other polymerization units with acid-cleavable groups may be comprised in the resin (column 5, lines 56-59) and specifically disclose the polymer (IV), which shows two units with acid-cleavable groups :



(IV) (Resin I in columns 15-16).

The resin (IV) comprises:

- a first unit of 2-ethyl-2-adamantyl methacrylate which is equivalent to the unit (a1) of formula (I) of the instant application, wherein R is a methyl group and R^1 is an ethyl group;

- a second unit of 2-methyl-2-adamantyl methacrylate which is equivalent to the unit (a2) of formula (III) of the instant application, wherein R is a meththyl group, and

- a third unit equivalent to the unit (a3) containing a lactone group of the instant application.

The resin comprising the units (I), (II) and (III) above is equivalent to a resin comprising the units (a1), (a3) and (a4) of the instant application.

The polymer (IV) is equivalent to a resin comprising the units (a1), (a2) and (a3) of the instant application.

Fujishima et al. do not specifically disclose a resin comprising the units (a1), (a2), (a3), (a4) of the instant application.

However, it would have been obvious to one of ordinary skill in the art at the time of the invention to obtain such a resin, based on Fujishima's teachings about the units that form the resin and the teaching that acid-cleavable units may be used in combination.

Fujishima et al. disclose that the unit (I) and other polymerization units having an acid-cleavable group (units (a1) and (a2) of the instant application) are preferably 30-80 mol% based on the total amount of the resin (column 6, lines 18-26).

Fujishima et al. disclose that the unit (III) (unit (a3) of the instant application) is comprised in an amount of 20-70 mol% of the resin (column 6, lines 32-39). This range overlaps the range of the instant application

Fujishima et al. further disclose that the unit (II)(unit (a4) of the instant application) may be comprised in an amount of 20-70 mol% of the resin (column 6, lines 41-43 and 46-50). This range overlaps the range of the instant application.

With regard to claims 7 and 18, Fujishima et al. disclose that the resin comprises an unit (III), equivalent to the unit (a3) of the instant application (column 3, lines 14-15 and 25-35).

With regard to claim 12, Fujishima et al. disclose that the acid generator may be diphenyliodonium trifluoromethanesulfonate (column 6, line 66), which is equivalent to the onium salt with a fluorinated alkylsulfonate anion used as acid generator (B) of the instant application.

With regard to claim 13, Fujishima et al. disclose that the chemical amplifying positive resist composition comprises nitrogen-containing organic compounds, such as amines (column 8, lines 9-56).

With regard to claim 14, Fujishima et al. disclose a process comprising the steps of:

- applying the resist composition to a substrate to form a resist film;

- drying the resist film,

- exposing for patterning;

- performing a heat-treatment, wherein the heat-treatment is equivalent to the post-exposure bake of the instant application, and

- developing with an alkali developer (column 9, lines 16-19).

With regard to claim 15-16, Fujishima et al. disclose that the heat-treatment (post-exposure bake) of the resist composition comprising the resin (IV) is performed at 110^{o}C (see Example 8 in table 2. column 19), which is within the range of claim 16.

As the first and second repeating units of the polymer (IV) are equivalent to the units (a1) and (a2) of the copolymer of the instant application and absent a record to the contrary, it is the examiner's position that the limitations of claim 15 are met.

With regard to claim 20, Fujishima et al. disclose that the resin may comprise a (meth)acrylonitrile unit (column 2, lines 29-31, column 3, lines 5-10 and column 3, line 63-column 4, line 16), which is equivalent to the unit (a5) which contains no acid dissociable, dissolution inhibiting groups, lactones or hydroxyl groups of the instant application.

With regard to claim 22, Fujishima et al. disclose that the solvent used for the resist composition may be propylene glycol monomemethyl ether acetate (PGMEA), ethyl lactate, γ-butyrolactone or a combination thereof (column 9, lines 1-15). Fujishima et al. specifically disclose a mixture of PGMEA and γ-butyrolactone (column 18, line 67 - column 19, line 1).

5. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fujishima et al. (US Patent 6,239,231) in view of Nishimura et al. (US Pg-Pub 2002/0009667).

With regard to claim 8, Fujishima et al. teach the resist composition of claim 1, wherein the resin comprises units (a1), (a2), (a3) and (a4) (see paragraph 4 of the Office Action) but fail to teach that the resin may be mixed with a polymer containing unit (a3).

Nishimura et al. disclose a chemically amplified positive tone resist comprising a resin (A), which contains a lactone-ring structure and acid dissociating groups (par.0056).

Nishimura et al.further disclose that the resin (A) may be used either individually or in combination of two or more (par.0266).

As Nishimura et al. teach that mixture of resins may be used in a chemically amplified positive tone resist, it would have been obvious to one of ordinary skill in the art at the time of the invention to use a combination of resins in the chemically amplified resist of Fujishima et al., with a reasonable expectation of success.

The resins of Fujishima et al. comprise repeating units with lactone rings, equivalent to the unit (a3) of the instant application (see Resins A and C in column 11-12, Resins E and G in column 14).

6. Claims 21 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fujishima et al. (US Patent 6,239,231) in view of Hada et al. (WO 03/048863, wherein the citations are from the English equivalent US Pg-Pub 2004/0058269).

With regard to claim 21, Fujishima et al. teach the resist compositions of claim 20 above (see paragraph 4 of the Office Action), wherein the resist composition comprises a resin with units (a1), (a2), (a3) and (a4) but fail to disclose that the resin may contain an unit (a5) comprising an aliphatic polycyclic group derived from a methacrylate ester.

Hada et al. disclose a chemically amplified positive type resist composition comprising a resin (A) for which the solubility in alkali increases under the action of an acid and an acid generator (B) which generates acid on exposure (par.0012), wherein the resin (A) is a copolymer comprising:

- an unit (a1) derived from a (meth)acrylate ester comprising a acid dissociable, dissolution inhibting group;

- an unit (a2) derived from a (meth)acrylate ester comprising a lactone containing monoecyclic or polycyclic group;

- an unit (a3) derived from a (meth)acrylate ester comprising a hydroxyl group containing polycyclic group and

- an unit (a4) derived from a (meth)acrylate ester comprising a polyclic group which is different from the unit (a1), (a2) and (a3) (par.0012).

The chemically amplified positive type resist composition of Hada et al. displays excellent resolution and enables improvement in the depth of focus range of an isolated resist pattern and suppression of any proximity effect (par.0010).

The unit (a1) of Hada et al. (par.0020-0023) is equivalent to the unit of formula (I) of Fujishima et al. and the units (a1), (a2) of the instant application.

The unit (a2) of Hada et al. (par.0028-0032) is equivalent to the α-methacryloyloxy-γ-butyrolactone unit (III) of Fujishima et al. and to the unit (a3) of the instant application.

The unit (a3) of Hada et al. (par.par.0034-0035) is equivalent to the unit (II) of Fujishima et al. and the unit (a4) of the instant application.

Due to the fact that the units (a1), (a2) and (a3) of Hada et al. are equivalent to the units (I), (II), (III) of Fujishima et al., it would have been obvious to one of ordinary skill in the art at the time of the invention to use the unit (a4) of Hada et al. as structural unit in the resin of Fujishima et al., in order to obtain a resin with excellent resolution and which enables improvement in the depth of focus range of an isolated resist pattern and suppression of any proximity effect (par.0010).

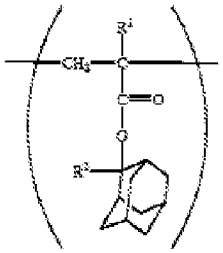
Hada et al. further disclose that the unit (a4) is preferably tricyclodecanyl (meth)acrylate, adamantyl (meth)acrylate, tetracyclodecanyl (meth)acrylate, due to their commercial availability (par.0036). These units are equivalent to the units (a5)

comprising an aliphatic polycyclic group derived from a methacrylate ester of the instant application.

With regard to claim 23, Fujishima et al. disclose a chemical amplifying positive resist composition comprising a resin and an acid generator (abstract) and a solvent (column 9, lines 1-15).

Fujishima et al. disclose a resin comprising:

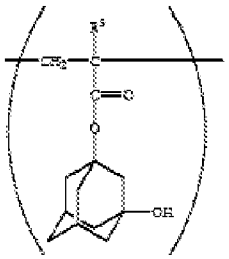
- an unit of 2-alkyl-2-adamantyl (meth)acrylate of formula (I):



(I) (formula (I) in column 2, lines 35-45), wherein R^1 represents hydrogen or methyl and R^2 represents an alkyl (column 2, lines 50-51).

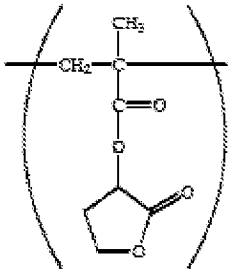
The alkyl-2-adamantyl in this unit is cleaved by the action of an acid and hence this unit contributes to the enhancement of alkali-solubility after exposure of the resist film (column 4, lines 44-51). This unit is equivalent to unit (a1) of the instant application.

- an unit of 3-hydroxy-1-adamantyl(meth)acrylate of formula (II):



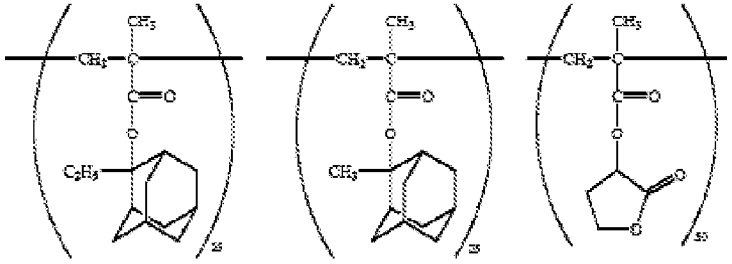
(II) (formula (II) in column 2, lines 55-65), wherein R^3 represents hydrogen or methyl (column 3, line 1), equivalent to the unit (a4) of the instant application.

- an unit of α-methacryloyloxy-γ-butyrolactone represented by the formula (III):



(III) (formula (IV) in column 3, lines 14-15 and 25-35), equivalent to the unit (a3) of the instant application.

Fujishima et al. also disclose that other polymerization units with acid-cleavable groups may be comprised in the resin (column 5, lines 56-59) and specifically disclose the polymer (IV), which shows two units with acid-cleavable groups :



(IV) (Resin I in columns 15-16).

The resin (IV) comprises:

- a first unit of 2-ethyl-2-adamantyl methacrylate which is equivalent to the unit (a1) of formula (I) of the instant application, wherein R is a methyl group and R^1 is an ethyl group;

- a second unit of 2-methyl-2-adamantyl methacrylate which is equivalent to the unit (a2) of formula (III) of the instant application, wherein R is a meththyl group, and

- a third unit equivalent to the unit (a3) containing a lactone group of the instant application.

The resin comprising the units (I), (II) and (III) above is equivalent to a resin comprising the units (a1), (a3) and (a4) of the instant application.

The polymer (IV) is equivalent to a resin comprising the units (a1), (a2) and (a3) of the instant application.

Fujishima et al. do not specifically disclose a resin comprising the units (a1), (a2), (a3), (a4) of the instant application.

However, it would have been obvious to one of ordinary skill in the art at the time of the invention to obtain such a resin, based on Fujishima's teachings about the units that form the resin and the teaching that acid-cleavable units may be used in combination.

Fujishima et al. fail to disclose that the resin may comprise an unit (a5) comprising an aliphatic polycyclic group derived from a methacrylate ester.

Hada et al. disclose a chemically amplified positive type resist composition comprising a resin (A) for which the solubility in alkali increases under the action of an acid and an acid generator (B) which generates acid on exposure (par.0012), wherein the resin (A) is a copolymer comprising:

- an unit (a1) derived from a (meth)acrylate ester comprising a acid dissociable, dissolution inhibting group;

- an unit (a2) derived from a (meth)acrylate ester comprising a lactone containing monoecyclic or polycyclic group;

- an unit (a4) derived from a (meth)acrylate ester comprising a polyclic group which is different from the unit (a1), (a2) and (a3) (par.0012).

The chemically amplified positive type resist composition of Hada et al. displays excellent resolution and enables improvement in the depth of focus range of an isolated resist pattern and suppression of any proximity effect (par.0010).

The unit (a1) of Hada et al.par.0020-0023) is equivalent to the first and second repeating units of the polymer (IV) of Fujishima et al. and the units (a1), (a2) of the instant application.

The unit (a2) of Hada et al. (par.0028-0032) is equivalent to the α-methacryloyloxy-γ-butyrolactone unit of the polymer (IV) of Fujishima et al. and to the unit (a3) of the instant application.

The repeating units of Hada et al. are equivalent to the units of the resin of Fujishima et al. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to use the unit (a4) of Hada et al. as structural unit in the resin of Fujishima et al., in order to obtain a resin with excellent resolution and which enables improvement in the depth of focus range of an isolated resist pattern and suppression of any proximity effect (par.0010).

Hada et al. further disclose that the unit (a4) is preferably tricyclodecanyl (meth)acrylate, adamantyl (meth)acrylate, tetracyclodecanyl (meth)acrylate, due to their commercial availability (par.0036). These units are equivalent to the units (a5)

comprising an aliphatic polycyclic group derived from a methacrylate ester of the instant application.

The unit (a4) is comprised in the resin in an amount of 10-20 mol% (par.0040), which is within the range of the instant application for the unit (a5).

Response to Arguments

7. Applicant's arguments filed on February 25, 2009 have been fully considered but they are not persuasive.

On pages 8-10 of the Remarks, the applicant argues that the amended claims 1, 17 and 23 claim compositions which lead to unexpected results.

On pages 8-9, the applicant shows that the compositions of amended claims 1 and 17 produce a reduction of the proximity effect without reducing the depth of focus.

The examiner would like to show the following: Examples 1 and 2 in the specification of the instant application show photoresist compositions comprising the units (a1), (a2), (a3) and (a4). The results given by the photoresists of Examples 1 and 2 are compared to the results given by the photoresist of Comparative Examples 1-3.

In the Comparative Examples 1-2, the photoresist comprises a resin constituted of units (a2), (a3) and (a4).

In the Comparative Example 3, the photoresist comprises a resin constituted of units (a1), (a2) and (a4).

The resin of Comparative Examples 1-3 do not comprise both units (a1) and (a2), both are units with acid dissociable groups.

However, the prior art Fujishima et al. clearly show a resin with 2 units with acid decomposable groups (see Resin I in column 15-16).

Therefore, the examiner considers that the Comparative Examples 1-3 are not representative for the teachings of Fujishima et al. and the comparative results are not sufficient to overcome the rejection over Fujishima et al.

On page 8, the applicant points to that the compositions comprising unit (a4) in an amount of at least 5 mol% but not exceeding 50 mol% prevent the deterioration of the resist pattern shape.

The examiner would like to show the following: Examples 1 and 2 in the specification of the instant application show photoresist compositions comprising the units (a1), (a2), (a3) and (a4). The results given by the photoresists of Examples 1 and 2 are compared to the results given by the photoresist of Comparative Examples 1-3.

In the Comparative Examples 1-2, the photoresist comprises a resin constituted of units (a2), (a3) and (a4).

In the Comparative Example 3, the photoresist comprises a resin constituted of units (a1), (a2) and (a4).

The resins in the Examples 1-2 and the Comparative Examples 1-3 all comprise the unit (a4), in an amount as claimed.

Due to the fact that all the resins of the Examples and Comparative Examples comprise the unit (a4), it is not possible to evaluate the effect of preventing the deterioration of the resist pattern shape due to the presence of unit (a4) in the resin.

On page 9, the applicant points to the composition of amended claim 23 , which comprises unit (a5) in an amount of 1-30 mol% to all structural units of the resin exhibits superior resolution for isolated patterns through to semi-dense patterns.

Example 3 shows a photoresist comprising a resin with units ((a1), (a2), (a3), (a4) and (a5), wherein the units (a5) are in an amount of 15 mol%.

The Comparative Examples 4-5 show a photoresist comprising a resin with units (a2), (a3), (a4) and (a5), wherein the units (a5) are in an amount of 15 mol%.

The Comparative Example 6 shows a photoresist comprising a resin with units (a1), (a3), (a4) and (a5), wherein the units (a5) are in an amount of 15 mol%.

The resins in the Example 3 and the Comparative Examples 4-6 all comprise the unit (a5), in the same amount.

Due to the fact that all the resins of the Examples and Comparative Examples comprise the unit (a5) in the same amount, it is not possible to evaluate the effect of unit (a5) in obtaining a superior resolution for isolated patterns through to semi-dense patterns.

Conclusion

8. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ANCA EOFF whose telephone number is (571)272-9810. The examiner can normally be reached on Monday-Friday, 6:30 AM-4:00 PM, EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Cynthia H. Kelly can be reached on 571-272-1526. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a

USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/A. E./
Examiner, Art Unit 1795

/Cynthia H Kelly/
Supervisory Patent Examiner, Art Unit 1795